

Sleep quality and student performance: a cross-cultural analysis

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Abstract: This study explores the impact of sleep quality on student academic performance through a cross-cultural lens, employing data mining techniques to analyze the complex relationships between sleep patterns and academic success. Previous research has demonstrated the negative effects of poor sleep on cognitive function, memory, and academic. However, the role of cultural norms, lifestyle factors such as stress, diet, and screen time in shaping sleep behaviors remains underexplored. Using data mining methods, this research analyzes large datasets collected from students across diverse cultural backgrounds to identify key factors influencing sleep quality and their subsequent impact on academic performance. The findings reveal those cultural attitudes toward sleep, stress levels, and lifestyle factors such as high screen time and poor diet significantly affect sleep quality, which in turn impacts academic outcomes. This study highlights the necessity of culturally tailored interventions to improve sleep hygiene and promote healthier habits. By applying data mining techniques to uncover patterns and correlations, this research contributes to a deeper understanding of how sleep quality varies across cultures and its implications for student success, providing a foundation for more effective, data-driven interventions to enhance student well-being globally.

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INTRODUCTION

Sleep is a fundamental aspect of human health and well-being, directly influencing cognitive functions, emotional stability, and physical health. For students, sleep plays a particularly crucial role in academic performance, impacting their ability to concentrate, retain information, and perform complex tasks. Research consistently highlights that sleep quality and duration are significant predictors of academic success across diverse cultural settings. However, poor sleep quality and insufficient sleep are prevalent issues among students, with studies such as Suardiaz Muro et al. (2020) revealing their detrimental effects on academic outcomes and overall well-being.

Stress is a critical factor contributing to sleep disturbances among students, as evidenced by Tan and Greenwood (2021), who found a negative correlation between perceived stress and sleep quality. High academic expectations, social pressures, and lifestyle factors exacerbate stress, leading to irregular sleep patterns. This relationship between stress and sleep quality underscores the complexity of addressing sleep-related issues among students, as interventions must consider both psychological and behavioral dimensions.

Cultural contexts significantly shape sleep patterns and attitudes, introducing cross-cultural variability in how sleep impacts academic performance. For instance, Cheung et al. (2021) observed that Japanese students sleep fewer hours than their Canadian peers but report feeling less tired and maintaining better health. Such findings suggest that cultural norms and attitudes toward sleep may mediate its perceived effects, complicating direct comparisons of sleep quality across regions. These insights emphasize the need for culturally sensitive approaches to understanding and improving student sleep habits.

In addition to cultural factors, variables directly affecting sleep quality include work-life balance, sleep hours, subjective physical health, online hours, frequency of eating healthy, and environmental satisfaction (Badri et al., 2023). These interconnected variables interact with lifestyle choices and societal structures, influencing both sleep quality and academic outcomes. For example, high online hours are associated with poorer sleep quality, while frequent healthy eating and better environmental satisfaction contribute to improved sleep. Understanding how these factors operate within different cultural contexts is vital for identifying effective interventions.

This research investigates the multidimensional impact of sleep on student performance through a cross-cultural lens. Specifically, it explores how sleep quality affects academic performance, identifies factors influencing sleep patterns, examines cross-cultural variations, and evaluates the role of lifestyle factors such as work-life balance, diet, and screen time. By integrating findings from diverse cultural contexts, this study aims to provide a comprehensive understanding of sleep's role in academic achievement and inform strategies to enhance student well-being and success globally.

Statement of the problem

The study aims to explore the multidimensional impact of sleep quality on student performance across diverse cultural settings.

Specifically, it seeks to:

- 1) To analyze the relationship between sleep quality and academic performance across diverse cultural contexts, addressing how sleep quality impacts student outcomes.
- 2) To identify and evaluate significant factors influencing sleep quality, including work-life balance, sleep hours, subjective physical health, online hours, frequency of eating healthy, and environmental satisfaction.
- 3) To investigate cross-cultural variations in the relationship between sleep quality and academic performance, focusing on how lifestyle factors such as work-life balance, diet, and screen time shape these dynamics.

METHODOLOGY

Research design

This study utilized a qualitative comparative research design, employing a systematic literature review and data mining methods to analyze the relationship between sleep quality and academic performance across diverse cultural settings (Creswell, 2020). A qualitative approach was chosen to explore the nuanced, context-specific factors influencing sleep and its impact on academic outcomes. The data mining component enabled the identification of trends and patterns within a broad range of existing studies.

Locale of the study and respondents

The research focused on cross-cultural analyses by synthesizing data from global regions, including Asia, Africa, North America, and Europe. Participants, indirectly represented through the data sources, comprised secondary and tertiary students from diverse educational

and cultural backgrounds. This approach ensured that findings reflect a wide variety of environmental, cultural, and lifestyle factors.

Research instruments

The primary research instruments were systematic literature review and data mining techniques. Academic databases were used to identify relevant studies on sleep quality and academic performance. The literature was critically analyzed to extract data on key variables such as work-life balance, sleep hours, subjective physical health, online hours, frequency of eating healthy, and environmental satisfaction. These instruments facilitated a comprehensive and comparative analysis of the cross-cultural relationships between sleep quality and academic performance.

Data analyses procedure

A thematic analysis was conducted to identify recurring patterns and context-specific differences in the relationship between sleep and academic performance. The data mining process involved categorizing studies based on themes such as work-life balance, diet, screen time, and environmental satisfaction. Cross-cultural variations were systematically compared and synthesized to highlight regional differences and universal trends. Findings were organized to address the research questions and provide evidence-based insights into the role of sleep-in academic success.

FINDINGS AND DISCUSSION

Work- life balance

Culturally sensitive interventions offer a more effective approach to addressing sleep quality issues than standardized methods by acknowledging the influence of cultural context on health behaviors. These localized interventions, like mental health support in Malaysia incorporating local language and practices or stress management in Ghana considering community dynamics, increase engagement, reduce stigma, and build trust, leading to better outcomes. This approach is particularly important for sensitive topics like mental health.

Further research should evaluate these interventions, comparing them to standard approaches and exploring mediating cultural factors, ultimately contributing to health equity and improved global sleep quality. A study by Nishioka et al. (2022) highlights how work-to-family conflict and job dissatisfaction influence sleep quality in culturally distinct ways. Their research emphasizes that culturally tailored approaches to improving sleep quality, such as interventions addressing unique work-life balance challenges, yield more effective results than standardized global solutions. For example, their findings suggest that incorporating cultural norms and practices into interventions can help reduce stigma and enhance trust, ultimately improving sleep and work performance outcomes.

Sleep hours

When it comes to encouraging improved sleep habits, regionally specific educational efforts work better than generic ones. A focused strategy, like a sleep hygiene program in Thailand, addressing shorter sleep lengths brought on by cultural norms, job schedules, or environmental variables, is essential given that cultural practices, beliefs, and socioeconomic issues all affect sleep. In order to provide culturally appropriate solutions and optimize effect through local languages and community involvement, this strategy necessitates a grasp of the

local environment, including cultural views around sleep, customs, and socioeconomic impacts.

Studies have found significant differences in sleep insufficiency across U.S. regional cultures, with areas prioritizing social investments reporting better sleep outcomes (Pronk et al., 2024). Adapting sleep hygiene recommendations for diverse, low-income communities requires addressing multilevel barriers, including individual, interpersonal, and environmental factors (Rottapel et al., 2020). Cross-cultural studies can provide valuable insights into environmental influences on sleep, both at macro and micro levels (Bliwise, 2008). While school-based sleep education programs have shown success in increasing sleep knowledge, they have not consistently led to behavioral changes in sleep habits (Blunden et al., 2012). Future interventions should consider theoretical frameworks like the theory of planned behavior to improve efficacy and address the complex factors affecting sleep across different populations.

Subjective physical health

Integrating physical activity into academic schedules and limiting screen time in dormitories represents a proactive and potentially impactful approach to enhancing student well-being. This strategy acknowledges the interconnectedness of physical health, sleep quality, and academic performance, moving beyond a narrow focus on solely academic pursuits. By incorporating physical activity, institutions can address the sedentary lifestyles often associated with academic life, promoting both physical and mental health benefits that can positively influence sleep. Simultaneously, limiting screen time in dormitories recognizes the detrimental effects of blue light exposure and excessive digital engagement on sleep patterns. This dual intervention addresses key modifiable factors contributing to poor sleep hygiene among students, potentially leading to improved academic outcomes, reduced stress levels, and a greater overall sense of well-being. However, successful implementation requires careful consideration of student input, logistical feasibility, and the development of supportive policies that promote a healthy balance between academic work, physical activity, and restorative sleep.

And also, physical activity and sleep habits play crucial roles in academic performance among students. Regular physical activity during examination periods can buffer the negative effects of stress on sleep quality, well-being, and affect (Wunsch et al., 2017). Meeting sleep and screen time guidelines is associated with better academic performance, while excessive sedentary behavior negatively impacts academic outcomes (Howie et al., 2020). Schools are encouraged to promote active lifestyles and proper sleep habits, as these factors directly influence students' performance and health (Ruiz-Pérez et al., 2017). Optimal academic achievement is associated with 7-9 hours of nightly sleep and 5-7 days of weekly physical activity, with a significant interaction between the two factors (Brown et al., 2022).

Online hours

University policies limiting pre-bedtime device use, coupled with educational campaigns about the negative impacts of late-night screen exposure on sleep and performance, are essential for promoting student well-being. This combined approach addresses the pervasive influence of technology on sleep disruption by establishing clear guidelines and empowering students with knowledge about the detrimental effects of screen time on sleep quality, cognitive function, and academic success.

Research indicates that digital media use before bedtime negatively impacts university students' sleep patterns, with longer durations associated with reduced sleep time and later

bedtimes (Orzech et al., 2016). The type of activity also plays a role, with computer work, internet surfing, and music listening showing strong relationships to sleep variables (Orzech et al., 2016). Factors such as fear of missing out (FoMO) and telepressure contribute to increased technology use and poor sleep hygiene among students (Rogers & Barber, 2019). Educational interventions addressing sleep hygiene and technology use have shown promise in improving objective sleep outcomes, particularly total sleep time and reduced awakenings (Barber & Cucalón, 2017). However, these interventions may not significantly impact subjective sleep quality or quantity (Barber & Cucalón, 2017). To fully understand the effects of screen use on sleep, researchers emphasize the importance of considering both biological and cognitive processes, including light exposure and content consumption (Woods & Scott, 2019).

Frequency of eating healthy

Providing balanced meal options in campus dining facilities offers a practical strategy for promoting healthy eating habits, which can positively influence both sleep and academic performance. This approach acknowledges the link between nutrition and overall well-being, recognizing that dietary choices can directly impact sleep quality and cognitive function. By offering nutritious and balanced meals, universities can empower students to make healthier choices, supporting better sleep patterns and enhancing their ability to focus and perform academically.

In addendum, balanced eating habits, particularly regular breakfast consumption, positively impact academic achievement, while fast food intake negatively affects grades (Reuter et al., 2020). Better sleep quality, longer duration, and greater consistency are associated with improved academic performance, accounting for nearly 25% of the variance in grades (Okano et al., 2019). Notably, sleep patterns over the month and week preceding exams, rather than the night before, correlate with better test results (Okano et al., 2019). Studies confirm that students with healthier sleep and dietary habits tend to achieve higher GPAs (Sarkar & Goswami, 2020). However, maintaining balanced nutrition and adequate sleep can be challenging for college students due to academic pressures (Savvidou, 2021).

Environmental satisfaction

Prioritizing dormitory infrastructure improvements to address air quality, thermal comfort, and noise levels is crucial for creating healthy and conducive living environments for students. Regular assessments of these factors enable universities to identify and mitigate environmental stressors that can negatively impact student sleep, well-being, and academic performance.

There are studies in Beijing and Shanghai found poor air quality, with CO₂ levels exceeding standards due to insufficient ventilation (Dan Miao et al., 2022; N. Zhang et al., 2016). Thermal comfort was also a concern, with dormitories tending to be warm and dry during heating periods or lacking adequate heating in winter (Dan Miao et al., 2022; N. Zhang et al., 2016). Noise levels were found to interfere with students' rest (Dan Miao et al., 2022). These IEQ factors contributed to health symptoms, poor sleep quality, and lower well-being (Dan Miao et al., 2022). Studies emphasize the need to consider building performance, bodily sensation, and humanistic environment in developing healthy dormitories (Zezhou Wu et al., 2020). Improving structural comfort conditions, including thermal comfort, audio comfort, visual comfort, and indoor air quality, is crucial for increasing student efficiency and satisfaction (Gulsah Yavuz Kocaman et al., 2017).

CONCLUSIONS

This study underscores the profound impact of sleep quality on student academic performance, revealing the intricate interplay of factors such as work-life balance, sleep hours, subjective physical health, online hours, eating habits, and environmental satisfaction. Across diverse cultural settings, findings highlight the universal challenges students face in achieving optimal sleep quality due to stress, unhealthy habits, and environmental conditions. For instance, cultural norms in Japan allow students to adapt differently to shorter sleep durations, while in regions like Sub-Saharan Africa, consistent sleep hours positively correlate with academic performance (Eakman et al., 2023; Buguet et al., 1990).

Key determinants of sleep quality, including high screen time, poor diet, and inadequate dormitory conditions, were identified as critical factors disrupting sleep patterns and reducing cognitive performance. Balanced nutrition, physical activity, and improved living environments emerged as pivotal interventions for enhancing sleep quality and, consequently, academic outcomes.

The findings emphasize the necessity of culturally tailored strategies to address sleep-related challenges. Universities can implement educational campaigns, promote balanced diets, and upgrade dormitory facilities to foster healthier lifestyles and sleep habits among students. These interventions can bridge the gap between sleep quality and academic success, ultimately contributing to holistic student well-being and performance.

REFERENCES

- Aung, K. T., Nurumal, M. S., & Zainal, S. R. (2016). Sleep quality and academic performance of nursing students.
- Badri, M., Alkhaili, M., Aldhaheri, H., et al. (2023). From good sleep to health and to quality of life – a path analysis of determinants of sleep quality of working adults in Abu Dhabi. **Sleep Science Practice, 7**, 1. <https://doi.org/10.1186/s41606-023-00083-3>
- Barber, L. K., & Cucalón, M. C. (2017). Modifying the Sleep Treatment Education Program for Students to include technology use (STEPS-TECH): Intervention effects on objective and subjective sleep outcomes. **Stress and Health, 33**, 684–690. <https://doi.org/10.1002/smi.2746>
- Bliwise, D. L. (2008). Invited commentary: cross-cultural influences on sleep--broadening the environmental landscape. **American Journal of Epidemiology, 168**(12), 1365-1366. <https://doi.org/10.1093/aje/kwn336>
- Blunden, S., Chapman, J., & Rigney, G. (2012). Are sleep education programs successful? The case for improved and consistent research efforts. **Sleep Medicine Reviews, 16**(4), 355-370. <https://doi.org/10.1016/j.smrv.2011.08.002>
- Brown, D. M., Porter, C. D., Hamilton, F., Almanza, F., Narvid, C., Pish, M., & Arizabalo, D. (2022). Interactive associations between physical activity and sleep duration in relation to adolescent academic achievement. **International Journal of Environmental Research and Public Health, 19**. <https://doi.org/10.3390/ijerph192315604>
- Buguet, A., Hankourao, O., & Gati, R. (1990). Self-estimates of sleep in African students in a dry tropical climate. **Journal of Environmental Psychology, 10**, 363-369. [https://doi.org/10.1016/S0272-4944\(05\)80035-0](https://doi.org/10.1016/S0272-4944(05)80035-0)
- Cabral, L. G., Queiroz, T. N., Pol-Fachin, L., & Santos, A. R. (2021). Digital technology and its impacts on sleep quality and academic performance during the pandemic. **Arquivos de Neuro-Psiquiatria, 80**, 1052-1056. <https://doi.org/10.1055/s-0042-1755395>
- Cheung, B. Y., Takemura, K., Ou, C. H., Gale, A., & Heine, S. J. (2021). Considering cross-cultural differences in sleep duration between Japanese and Canadian university students. **PLoS ONE, 16**. <https://doi.org/10.1371/journal.pone.0250671>

- Cheng, S., Shih, C., Lee, I., Hou, Y., Chen, K., & Yang, Y. (2012). A study on the sleep quality of incoming university students. **Psychiatry Research, 197**, 270-274. <https://doi.org/10.1016/j.psychres.2011.08.011>
- Eakman, A., Kawakatsu, Y., Takahata, M., Muraoka, S., Kudo, D., Satake, S., & Sato, T. (2023). Predictors of sleep duration among university students in Japan: Cross-cultural insights for developing sleep health interventions. **SLEEP**. <https://doi.org/10.1093/sleep/zsad077.0176>
- Fukuie, T., Inoue, K., & Yamaguchi, A. (2023). Lifestyle elements for improving mental and physical health in Japanese university students: Subjective sleep quality is a common key factor. **American Journal of Lifestyle Medicine**. <https://doi.org/10.1177/15598276231156546>
- Howie, E. K., Joosten, J., Harris, C., & Straker, L. M. (2020). Associations between meeting sleep, physical activity or screen time behaviour guidelines and academic performance in Australian school children. **BMC Public Health, 20**. <https://doi.org/10.1186/s12889-020-08620-w>
- Im, H., Doo, H., Chun, H., Suh, E., Han, K., Wang, C., & Doo, M. (2020). The association between sleep quality and eating habits among international students in South Korea. **Current Developments in Nutrition**. https://doi.org/10.1093/cdn/nzaa043_060
- Kocaman, G. Y., Sezer, F. S., & Cetinkol, T. (2017). User satisfaction of indoor environmental quality in student dormitories. **European Journal of Sustainable Development, 6**, 11-22. <https://doi.org/10.14207/EJSD.2017.V6N1P11>
- Miao, D., Cao, X., & Zuo, W. (2022). Associations of indoor environmental quality parameters with students' perceptions in undergraduate dormitories: A field study in Beijing during a transition season. **International Journal of Environmental Research and Public Health, 19**. <https://doi.org/10.3390/ijerph192416997>
- Ma, C., Zhou, L., Xu, W., Ma, S., & Wang, Y. (2020). Associations of physical activity and screen time with suboptimal health status and sleep quality among Chinese college freshmen. **PLoS ONE, 15**. <https://doi.org/10.1371/journal.pone.0239429>
- Naja, F., Hasan, H., Khadem, S., Buanq, M., Al-Mulla, H., Aljassmi, A., & Faris, M. (2022). Adherence to the Mediterranean diet and its association with sleep quality and chronotype among youth: A cross-sectional study. **Frontiers in Nutrition, 8**. <https://doi.org/10.3389/fnut.2021.805955>
- Nishioka, R., Tatsuse, T., Sekine, M., & Yamada, M. (2022). Association of sleep, work environment, and work-life balance with work performance. **Journal of Occupational and Environmental Medicine, 65**, e61-e67. <https://doi.org/10.1097/JOM.0000000000002755>
- Okano, K., Kaczmarzyk, J. R., Dave, N., Gabrieli, J. D., & Grossman, J. C. (2019). Sleep quality, duration, and consistency are associated with better academic performance in college students. **NPJ Science of Learning, 4**. <https://doi.org/10.1038/s41539-019-0055-z>
- Orzech, K. M., Grandner, M. A., Roane, B. M., & Carskadon, M. A. (2016). Digital media use in the 2 h before bedtime is associated with sleep variables in university students. **Computers in Human Behavior, 55*(A), 43-50*. <https://doi.org/10.1016/j.chb.2015.08.049>
- Peltzer, K., & Pengpid, S. (2016). Sleep duration and health correlates among university students in 26 countries. **Psychology, Health & Medicine, 21**, 208-220. <https://doi.org/10.1080/13548506.2014.998687>
- Pronk, N. P., Arena, R., Laddu, D. R., & Woodard, C. (2024). Regional cultures and insufficient sleep in the United States. **Journal of Activity, Sedentary and Sleep Behaviors**. <https://doi.org/10.1186/s44167-023-00043-3>
- Ramón-Arбуés, E., Granada-López, J., Martínez-Abadía, B., Echániz-Serrano, E., Antón-Solanas, I., & Jerue, B. (2022). The association between diet and sleep quality among Spanish university students. **Nutrients, 14**. <https://doi.org/10.3390/nu14163291>
- Reid, A., & Baker, F. C. (2008). Perceived sleep quality and sleepiness in South African university students. **South African Journal of Psychology, 38**, 287-303. <https://doi.org/10.1177/008124630803800203>
- Reuter, P. R., Forster, B. L., & Brister, S. R. (2020). The influence of eating habits on the academic performance of university students. **Journal of American College Health, 69**, 921-927. <https://doi.org/10.1080/07448481.2020.1715986>

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- Rogers, A. P., & Barber, L. K. (2019). Addressing FoMO and telepressure among university students: Could a technology intervention help with social media use and sleep disruption? **Computers in Human Behavior, 93**, 192-199. <https://doi.org/10.1016/j.chb.2018.12.016>
- Rottapel, R. E., Zhou, E. S., Spadola, C. E., Clark, C. R., Kontos, E., Laver, K., Chen, J. T., Redline, S., & Bertisch, S. M. (2020). Adapting sleep hygiene for community interventions: A qualitative investigation of sleep hygiene behaviors among racially/ethnically diverse, low-income adults. **Sleep Health**. <https://doi.org/10.1016/j.sleh.2019.12.009>
- Ruiz-Pérez, L. M., Gómez-Ruano, M., & Navia-Manzano, J. A. (2017). Physical activity practice, sleeping habits and academic achievement. **Health and Academic Achievement**. <https://doi.org/10.5772/INTECHOPEN.71282>
- Sarkar, S., & Goswami, S. (2020). Effect of diet and sleep on academics of undergraduate students.
- Savvidou, P. (2021). Fueling the body and mind. Teaching the whole musician. <https://doi.org/10.1093/oso/9780190868796.003.0009>
- Seun-Fadipe, C., & Mosaku, K. (2017). Sleep quality and psychological distress among undergraduate students of a Nigerian university. **Sleep Health, 3**, 190-194. <https://doi.org/10.1016/j.sleh.2017.02.004>
- Short, M. A., Gradisar, M., Lack, L. C., Wright, H. R., Dewald, J. F., Wolfson, A. R., & Carskadon, M. A. (2013). A cross-cultural comparison of sleep duration between U.S. and Australian adolescents. **Health Education & Behavior, 40**, 323-330. <https://doi.org/10.1177/1090198112451266>
- Tan, C. P., & Greenwood, K. M. (2021). Stress, sleep and performance in international and domestic university students. **Journal of International Students**. <https://doi.org/10.32674/JIS.V12I1.3299>
- Tsang, T., Mui, K., & Wong, L. (2021). Investigation of thermal comfort in sleeping environments and its association with sleep quality. **Building and Environment, 187**, 107406. <https://doi.org/10.1016/j.buildenv.2020.107406>
- Woods, H. C., & Scott, H. (2019). Merging the biological and cognitive processes of sleep and screens. **Current Sleep Medicine Reports, 5**, 150-155. <https://doi.org/10.1007/s40675-019-00149-8>
- Wu, Z., Liu, L., Li, S., & Wang, H. (2020). Investigating the crucial aspects of developing a healthy dormitory based on Maslow's hierarchy of needs—a case study of Shenzhen. **International Journal of Environmental Research and Public Health, 17**. <https://doi.org/10.3390/ijerph17051565>
- Zhang, N. B., Kang, Y., Zhong, K., & Liu, J. (2016). Indoor environmental quality of high occupancy dormitory buildings in winter in Shanghai, China. **Indoor and Built Environment, 25**, 712-722. <https://doi.org/10.1177/1420326X15586443>